Lower Sixth AL Maths Homework 5 **Name:**

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4 (a) (i) Express as a single logarithm

$$\log_a 36 - \frac{1}{2}\log_a 81 + 2\log_a 4 - 3\log_a 2$$

[3 marks]

4 (a) (ii) Hence find the value of a, given

$$\log_a 36 - \frac{1}{2}\log_a 81 + 2\log_a 4 - 3\log_a 2 = \frac{3}{2}$$

[1 mark]

4 (b) Solve the equation $9e^{2x} = 16$, expressing your answer in the form $\ln p$ where p is a rational number.

[2 marks]

9 A curve has equation $y = e^{2x}$

Find the coordinates of the point on the curve where the gradient of the curve is $\frac{1}{2}$

Give your answer in an exact form.

[5 marks]

10 David has been investigating the population of rabbits on an island during a three-year period.

Based on data that he has collected, David decides to model the population of rabbits, R, by the formula

$$R = 50e^{0.5t}$$

where t is the time in years after 1 January 2016.

10 (a) Using David's model:

10 (a) (i) state the population of rabbits on the island on 1 January 2016;

[1 mark]

10 (a) (ii) predict the population of rabbits on 1 January 2021.

[1 mark]

10 (b) Use David's model to find the value of t when $R = 150$, giving your answer to three significant figures.

[2 marks]

10 (c) Give **one** reason why David's model may **not** be appropriate.

[1 mark]

10 (d) On the same island, the population of crickets, C, can be modelled by the formula

$$C = 1000e^{0.1t}$$

where t is the time in years after 1 January 2016.

Using the two models, find the year during which the population of rabbits first exceeds the population of crickets.

[3 marks]

2 A zoologist is investigating the growth of a population of red squirrels in a forest.

She uses the equation $N = \dfrac{200}{1+9e^{-\frac{t}{5}}}$ as a model to predict the number of squirrels, N, in the population t weeks after the start of the investigation.

What is the size of the squirrel population at the start of the investigation?

Circle your answer.

[1 mark]

5 20 40 200

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